ident Wilson to continue the custom of his immediate predecessors of appointing the commissioner of fisheries for partisan rather than for public services, he appointed the man who stood first in the committee's recommendations.

Again, in appointing the chief of the Weather Bureau, President Wilson took unusual means to secure the best available man by requesting the National Academy of Sciences to recommend a suitable person for the position. Although the Academy was established by Act of Congress in 1863 to serve as adviser to the government in matters of science, and although since that time it has had among its members the most distinguished scientific men in America, this was the first time that a president of the United States ever asked the Academy for advice as to a scientific appointment. Also, in the selection of the chief chemist of the Department of Agriculture and of the chief of the Bureau of Mines, the president sought and acted upon the best scientific advice which he could get. In no one of these cases did he inquire about the political affiliation of the person recommended.

In many other matters President Wilson has shown an unusual and unprecedented desire to consult the leading scientific bodies of this country on subjects of science and a marked degree of independence in following their advice, sometimes in spite of much political or personal opposition. Through his individual action the question of the best means of abating the slides at Panama was referred to the National Academy of Sciences, and at his request a committee was appointed to investigate and report upon this subject; the names of the committee were a sufficient guarantee that their work would be well done, and their report, which was promptly made, will probably be of inestimable value to the nation. Quite recently the President requested the National Academy of Sciences to take the initiative in bringing into cooperation existing governmental, educational, industrial and other research organizations with the object of promoting national welfare and of providing for national defense. As a result there has been established through the cooperation of national scientific societies, research institutes, universities and the scientific departments of the government a National Research Council, as described by Dr. George E. Hale in a letter to *The Times* on August 1, which should be of great and lasting value to this nation.

Under these circumstances it does not seem fitting that scientific men should allow to go unchallenged the statement that the scientific work of the government has been degraded by President Wilson's appointments or the implication that his interest in that work has been that of a partisan.—*Edwin G. Conklin of Princeton University in the New York Times.*

SCIENTIFIC BOOKS

Analytical Mechanics. By H. M. DADOURIAN, M.A., Ph.D. Second edition, revised and enlarged.

In his second edition of his "Analytical Mechanics," Dr. Dadourian has made a number of changes and additions. What he assumes as the fundamental principle of mechanics he now calls the "Action Principle" which is a modified form of what he formerly called "The Principle of Action and Reaction." "A new chapter has been added which is devoted to the equilibrium of framed structures and graphic statics." "The number of diagrams has been increased by one hundred and thirty, and about three hundred practical problems have been added." Other smaller changes have been made. In all the book has been enlarged by about seventy additional pages.

In his first edition, the author states that the book "is based upon a course of lectures and recitations which the author has given during the last few years to the junior class of the electrical department of the Sheffield Scientific School." "In order to make the book suitable for the purposes of more than one class of students a larger number of special topics are discussed than any one class will probably take up. But these are so arranged as to permit the omission of one or more without breaking the logical continuity

of the subject." "The historical order of the development of mechanics is followed by discussing equilibrium before motion."

The author certainly has given considerable thought to the preparation of his book, which contains some very interesting matter. In the large collection of problems he gives, there will be found some very interesting ones. The reviewer himself was sufficiently interested to think out solutions for a number of them.

The plan of the book is certainly unique in a number of ways. This is not necessarily a criticism. There is a wide feeling that text-books in mechanics written for our engineering students fail to interest the students as they ought to do, and it may be that that book that will be found most satisfactory will be written according to a plan that will be quite unique when compared with the plans in accordance with which our present standard text-books on mechanics are written. The reviewer of this particular text-book is unable to appreciate, however, the author's point of view of some parts of his book.

In the first place, the author devotes his first chapter (of 11 pages) to "Addition and Resolution of Vectors." After that he merely states that a quantity has magnitude and direction and that, therefore, it is a vector. In the composition and resolution of such quantities, he then uses the law of addition and resolution of vectors as developed in his first chapter. This makes everything easy, at least as far as the author is concerned. For instance, the composition of couples reduces itself to this: "The resultant of two couples is a third couple whose torque is the vector sum of the torques of the given couples." That is all that need be said concerning the composition of couples. Similarly for the composition of the other directed quantities.

The reviewer does not wish to criticize this mode of procedure but wishes to ask if this mode of procedure is legitimate. Vector addition is simply one of the operations in an algebra in which the parallelogram law is made one of the fundamental assumptions. Before we apply the law of vector addition to any kind of quantity, ought we not first assure ourselves that the parallelogram law holds for these quantities? Since force, for instance, is a directed quantity, does it follow that the parallelogram law holds for forces? The same may be said of other directed quantities. Vector representation of directed quantities is very important and useful, and vector addition and resolution should be given, but it should be given only after we are assured that the parallelogram law holds with reference to such quantities. If the author is correct in reversing this process, then certainly the theory underlying the composition and resolution of directed quantities becomes very simple.

In the second place, the author's plan is unique in that he takes the following principle as the foundation of his book: "The vector sum of all the external actions to which a system of particles or any part of it is subject at any instant vanishes." This principle he calls the "action principle." To understand what the author means by this principle, we must understand what he means by "action."

On page 15, the author states that "all actions to which a particle is capable of being subject may be divided in two classes, namely, *forces* and *kinetic reactions.*" He then defines force as the action of one particle upon another. On page 17, he states that kinetic reaction represents the action of the ether on a particle and that it equals the product of the mass of the particle by its acceleration. That is, if q is this kinetic reaction then $q = -ma$. The negative sign is used since the direction of the action of the ether on a particle is opposite to the direction the particle is accelerating. If now F is the vector sum of the forces acting on one particle then the above action principle may be stated as follows (page 17):

$$\Sigma(F + q) = 0.$$

The reviewer is not sure that he understands what the author means by kinetic reaction. On page 17 and also on page 150, he states that kinetic reaction is the action of the ether on a particle. And on page 150 he adds that "kinetic reactions are not aggressive. In this respect they are similar to resisting and fric-

tional forces, but the latter come into action with velocity, while the former come into play with acceleration." On page 152 he states that "both forces and kinetic reaction must be the same type of magnitude."

These statements, together with others, seem to indicate that the author considers kinetic reaction as something real and of the nature of a force. In fact it is a force, although the author on page 150 states that kinetic reaction can not be called a force because we have restricted the latter term to the action of one material body upon another. Call it what we will, to the reviewer it seems to be nothing more nor less than a backward pull of the ether on a body as the body moves through the ether with accelerated motion. In fact, the author seems to say that the inertia of a body is due to the force with which the ether is pulling back on a body when the body is being accelerated.

Assuming that the author's conception of kinetic reaction is here correctly given, the reviewer is inclined to believe that several questions will at once present themselves to the readers of his book.

Why is it that the ether acts on a body only when it is being accelerated and not when the body is moving with constant velocity?

If kinetic reaction is the action of the ether on a particle, and if it is the same kind of a quantity as force (is a force in fact), and if the resultant force F acting on a particle and the kinetic reaction q are always equal in magnitude but opposite in direction (both equal to ma in magnitude), why is the body not in equilibrium? The author recognizes this difficulty in a footnote (page 153) by stating in effect that we must not call kinetic reaction a force, for if we do then the vector sum of all the forces acting on a particle will always equal zero without this particle necessarily being in equilibrium, a state of affairs which is not consistent with the condition of equilibrium of a particle. Refusing to call kinetic reaction a force, however, in order to keep out of trouble simply dodges the question and does not answer it.

The reviewer does not wish to say that the author is wrong in his conception. All he wishes to say is that he entirely fails to appreciate the author's point of view.

There is considerable difference between the author's action principle and D'Alembert's principle. Let there be a number of forces acting on a particle, then the resultant force (an ideal force) equals ma, or $R = ma$. This ideal force may be called the effective force. D'Alembert's principle then says that a system of forces acting on a particle together with the reversed effective force will form a system of forces in equilibrium. It should be remembered that this reversed effective force is an ideal force and not a real force. Now in the author's action principle the kinetic reaction is a real force (or action as the author prefers to call it) and is due to the action of the ether on a particle.

The author's action principle (even if sound) involves a number of conceptions which must be understood in order to understand the principle itself, and it seems that such a principle ought to follow rather than precede an elementary treatment of mechanics.

E. W. RETTGER

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SPECIAL ARTICLES

EXPERIMENTAL ABLATION OF THE HYPOPHYSIS IN THE FROG EMBRYO

IN the following preliminary paper the effect of the extirpation of the epithelial portion of the hypophysis upon the subsequent growth and development of tadpoles is summarized. The work was first attempted in 1914, *Diemyctylus torosus* being used, repeated in 1915 upon *Rana pipiens*, and again repeated in 1916 upon *Rana boylei*. In this paper the results obtained with *R. boylei* are reported.

The operation was most successfully carried out upon approximately 3 mm. larvæ, at which time the tail-bud is forming and the stomadeum can be detected. At that stage the epithelial hypophysial invagination can be accurately determined from the pit that it forms, or from its location between the protuberance of the forebrain and the stomadeum, and can be removed without injury to the adjacent brain.